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ABSTRACT

When readability formulas are used to review workbooks and textbooks their value is limited because application techniques have failed to take into consideration the exercises and examples in these books. The O'Hear and Ramsey (OR) Corrective technique has been developed to alleviate this problem. It allows readability data to be used accurately in making two kinds of comparisons. First, the reading levels of text, exercises, and examples within a book can be compared, thus revealing possible inconsistencies. Second, the data can be used (1) to produce whole-book reading levels (which have been adjusted on the basis of the three categories) and therefore (2) to compare one book with another. No matter which readability formula is used, the first three steps in applying the OR Corrective technique are the same: select chapters; estimate amount of text, exercise, and example in those chapters; and calculate estimated percentage of text, example, and exercise in the whole book. The fourth step, determining the readability level of each content category, differs with the formula selected. The fifth step, recombining the levels of the categories to obtain corrected whole-book readability, is again universal. To see whether the OR Corrective technique improved the accuracy of readability estimates, it was used with the Flesch, SMOG, and Fry formulas in determining the readability of three textbooks. Results determined that this technique is a way to gain accurate readability data. (HOD)

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The OR Corrective: Making Readability Formulas Work for Workbooks and Textbooks

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The OR corrective:
Making readability formulas work for workbooks and textbooks

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Readability formulas are potentially useful tools for evaluating textbooks on the community college and college level (Longo, 1982). However, when they have been used in reviewing workbooks and textbooks in such basic subjects as English composition, reading/study skills, mathematics, and science their value has been limited because application techniques have failed to take into consideration the unique characteristics of books in these disciplines. A technique, the OR corrective, has been developed to alleviate this problem.

The main difficulty in obtaining readability data for workbooks/textbooks of the sort mentioned arises because the books do not simply contain instructional text; they also include exercises and examples. The readability of these exercises and examples is as critical as that of the text itself, sometimes more so. In English composition, for instance, books make frequent and varied use of examples ranging from single sentences to essays occupying several pages. The readability level of such book segments is clearly significant. Likewise, the exercises which fill many workbook/textbook pages are critical to a student's ability to apply the principles and conventions explained in the text. And yet we have found not only that the readability of examples often differs from that of exercises, but also that the readability of both may vary markedly from the readability of the text in which they are embedded. In two recent studies using the Flesch formula for determining reading ease, one of English workbooks and another of basic writing texts (O'Hear & Ramsey, 1983; O'Hear & Ramsey, in press), only two books out of twenty-three tested had a consistent readability level among text, exercise, and example. Seven of these books had reading-ease scores scattered over three or more levels. With such apparent differences in readability, it is clear that any measurement which does not take into account all three categories is dangerously inadequate.

This readability problem is further compounded by variations in the space which books devote to these categories. In looking at fifteen recently published basic writing workbooks/textbooks, we found that the percentage of space devoted to text varied from 16% to 61%. The percentage of space devoted to example varied from 10% to 28%, and the percentage devoted to exercise varied from 15% to 74%. We found no book which had an equal distribution of text, example, and exercise (O'Hear & Ramsey, in press). Given this information about the nature of these books, one cannot justly apply any readability formula to them without also adjusting that formula to allow for these variations.

The OR Corrective is a technique which allows readability data to be used accurately in making two important kinds of comparisons. First, the reading levels of text, exercises, and examples within a book can be compared, thus revealing possible inconsistencies. Second, the data can be used to produce whole-book reading levels which have been adjusted on the basis of the three categories and therefore can be used to compare one book to another more accurately.

STEPS IN USING THE OR CORRECTIVE WITH A READABILITY FORMULA

Step One

First, no matter which readability formula is to be used, select at least three substantial chapters or sections, one from near the beginning, one from the middle, and one from near the end of the book. (The first and last chapters sometimes contain almost all text and are thus not typical. If this is the case, do not select these chapters.)

Step Two

Second, determine the approximate amount of text, example, and exercise in each of these chapters. Do this by tallying, page by page, the space devoted to each of the categories. We found that counting by fourths of a page produced a sufficiently fine distinction, so that a page might, for example, be counted as one fourth of a page of text, one fourth of a page of exercise, and one half of a page of example. Do not count white space. This means that in some cases a nominally full page will count only, say, one fourth of a page of text and one fourth of a page of example. Count graphs and charts as text, example, or exercise as appropriate; however, consider cartoons and display art as blank space unless their instructional purpose is clearly evident. Similarly, exercises sometimes consist of three of four lines of instruction followed by several lines (or even pages) of blank, lined paper; do not count this blank space. While providing students with paper on which to write their answers may signal an author's belief in the importance of the exercises, it has no effect on their readability.

These two steps are somewhat awkward to describe and thus sound complicated, but in practice they are simple and rapid, and produce information about a book which is accurate and often surprising.

Step Three

The third step has three phases: 1) add the fractions of space per page in all three chapters for each category to obtain the number of pages devoted to each category; 2) add the three totals to find the total number of pages in the three chapters (because blank space is not counted, this total may be smaller than the number of actual pages used); 3) divide the number of pages in each category by this total to get the estimated percentage of pages which the book devotes to text, to exercise, and to example.

t = number of pages devoted to text (corrected to omit blank space)

e = number of pages devoted to exercise (corrected to omit blank space)

m = number of pages devoted to example (corrected to omit blank space)

N = total number of pages in chapters or sections (corrected to omit blank space)

$\frac{t}{N} = P_t$ (% of book devoted to text)

$\frac{e}{N} = P_e$ (% of book devoted to exercise)

$\frac{m}{N} = P_m$ (% of book devoted to example)

It is not necessary to count words and thus obtain exact percentages; a sufficient estimate results from a count based on fourths of a page. These estimated percentages will be factored into whatever readability formula is applied.

Step Four

Fourth, apply the traditional procedure for the readability formula selected, addressing text, examples, and exercises separately. The formulas generally work with 100-word samples. For convenience, these samples can be taken from the chapters or sections that were selected in step one as a basis for estimating the relative amount of space devoted to text, example, and exercise. However, a special problem frequently occurs in obtaining coherent readability samples because of the way books interweave text, example, and exercise. Sometimes, for example, short passages of text are separated by examples. In this case, the examples should not be mixed with the text. Text samples should be added up from both sides of the examples. Also, one-hundred-word examples are rare in some books, so it may be necessary to take consecutive examples extending through a considerable portion of the chapter or section under scrutiny. Or sometimes a single exemplary sentence will be repeated with only slight variation. For instance, in a section dealing with run-on sentences, the same illustration might appear first in incorrect form, then as two sentences, then as a single sentence employing a conjunction, and finally as a single sentence employing a semi-colon. Count only one of these variations in determining readability. Although some examples must thus be passed over, it is important to take the examples for the study from the same sections of the book that the text and exercise samples come from, because one of the important pieces of information the Corrective yields is how well a section of text matches its own examples in readability.

Step Five

Fifth, to determine whole-book readability, recombine the readability scores obtained for each category, weighting each score according to the percentage of the book devoted to its category. The single score which results is representative of the effect on readability produced by all three kinds of materials critical to books of the sort discussed here.

APPLICATION OF THE OR CORRECTIVE

No matter which readability formula is used, the first three steps in applying the Corrective are the same: a) select chapters, b) estimate amount of text, exercise, and example in those chapters and c) calculate estimated percentage of text, example and exercise in the whole book. The fourth step, determining the readability level of each content category, will differ with the formula selected. The fifth step, recombining the levels of the categories to obtain corrected whole-book readability, is again universal.

To see how the OR Corrective improves the accuracy of readability estimates, we used it with the Flesch, SMOG, and Fry formulas in determining the readability of three textbooks chosen from among recent publications in writing, reading, and study-skills texts:

Flemming, L.E. (1983). *Reading for results.* Houghton-Mifflin.

McWhorter, K.T. (1980). *College reading and study skills.* Little, Brown.

Stith, J. (1982). *The basic writing book*. Little, Brown.

When we applied the first three steps of the Corrective to these three books, we found percentages of text, exercise and example as listed in Table 1.

Table 1

Comparative Percentages of Text, Example, and Exercise

	Text	Example	Exercise
Flemming	21.5	8.6	69.9
McWhorter	47.5	14.3	38.2
Stith	16	17	67

In the fourth step of the OR Corrective, we applied readability formulas separately to samples of text, exercise, and example. The application procedure varied, of course, from formula to formula.

In the fifth and final step of the Corrective, we incorporated data obtained in the first four steps to produce corrected, whole-book readability scores. For this step we multiplied the readability score for each content category by the percentage of the book devoted to that category, and then added the three products. The following formula represents this step:

$$TR(P_t) + MR(P_m) + ER(P_e) = R$$

where

TR = instructional text readability
ER = exercise readability
MR = example readability
P = percentage of text (P_t), example (P_m), and exercise (P_e)
R = corrected readability

In applying the Fry technique, two factors (sentence length and word difficulty) were used. In using the Corrective with the Fry, we applied the formula to both factors individually.

In applying the Flesch formula (Flesch, 1951), we multiplied the average sentence length of our samples by 1.015 and the number of syllables in the samples by 0.846. We then added the products and subtracted the total from 206.835, yielding a score which was used to find reading-ease level on a scale ranging from very easy to very difficult.

From each of the chapters which we used to determine percentage of content types, we selected three one-hundred-word samples of text, exercise, and example. For each of these samples we obtained sentence length and syllable counts as called for by the formula. We kept samples discrete so that we obtained readability scores for text, exercise, and example separately. After obtaining the reading-ease score, we applied the Corrective formula in combining the readability scores for the three areas. For example, in dealing with the Flemming book, we multiplied the text readability score by 0.215, the example readability score by 0.086, and the exercise readability score by 0.699. Finally, for comparison purposes, we obtained a readability rating using only samples of text, the usual way of estimating readability. Comparative data appear in Table 2.

Table 2

Flesch readability levels with and without OR Corrective

	Without Corrective	With Corrective
Flemming	**58.4 (Fairly Difficult)**	**53.0 (Fairly Difficult)**
McWhorter	**59.1 (Fairly Difficult)**	**46.9 (Difficult)**
Stith	**85.6 (Standard)**	**73.6 (Fairly Easy)**

Only the Flemming book remained on the same Flesch readability level after the OR Corrective was applied. Both of the other textbooks changed levels. In all cases the second readability score more closely represents the content of the books because it was derived from a set of samples which took into account not only all three categories, but also the emphasis placed on those categories. When example and exercise were more difficult than text, and represented a greater proportion of the book, their mathematical component—readability score multiplied by percentage of book—lowered the book's overall score. When they were easier, their mathematical component raised the book's overall score.

To use the OR Corrective with the SMOG formula, we first completed steps one, two, and three. Then, as step four, we took ten-sentence readings of text, exercise, and example from three chapters, so that we had a total of nine readings, and applied the SMOG formula separately to our three-reading samples of text, example, and exercise. Finally, we applied the OR Corrective step five in the process. Table 3 illustrates the score differences obtained by using the OR Corrective as opposed to using text only to determine readability level.

Table 3

SMOG readability levels with and without OR Corrective

	Without Corrective	With Corrective
Flemming	**13.0**	**12.1**
McWhorter	**12.0**	**12.1**
Stith	**11.0**	**8.9**

Only in the case of McWhorter do the results remain the same for both systems. In the McWhorter book, both text (47.5% of the book) and exercises (38.2%) are 12.0 grade level; examples (14.3%) are 13.0 grade level. In the other textbooks, the variation among grade level estimates for text, exercise and example is greater: two grade levels in Flemming, four in Stith. The Corrective formula picks up this differential and reflects it in the whole-book grade level estimate.

In using the Fry formula, we modified the usual procedure by gathering three samples each of text, example, and exercise from three different chapters. We then found sentence length and word difficulty (number of syllables). As directed in the formula, we added the sentence length of each set of passages and divided the result by three, yielding in this case the average sentence length for text, example, and exercise separately. We followed the same addition/division process with the number of syllables for each group. At this point, we graphed the results to find the grade level for each of the three groups. Results are shown in Table 4.

Table 4

Fry readability levels with and without OR Corrective

	Without Corrective	With Corrective
Flemming	11	9.5
McWhorter	College	College
Stith	11	7.6

Only in the McWhorter sample do the estimates match. This is because there is no meaningful way to integrate Fry's College and Professional levels. Since 85.7% of McWhorter's book is composed of text and exercise, it seemed reasonable in this case to label the book College level. For each of the other two books the difference was more meaningful. Samples from the Flemming book were 11.0, 10.0, and 9.0 grade levels for text, example, and exercise respectively. We estimated that the Flemming book was 69.9% exercise, and using the Corrective to weight this percentage when applying the Fry formula lowered our whole-book grade level estimate significantly. In the case of Stith, both exercise and example were on a 7.0 grade level, while text was on the 11 grade level. Since 84% of the book was devoted to example and exercise, applying the Corrective again produced a substantially lower grade level estimate.

The SMOG and Fry formulas produce different grade level scores, and the Corrective was not intended to compensate for this. Fry data were used because the Fry formula is perhaps the one most frequently applied to college texts. Fry data have been validated with those from Dale-Chall, Flesch, and Farr-Jenkins-Patterson (Longo, 1982), but not with the SMOG formula. This may explain the differences in grade level produced by these two formulas.

SUMMARY

Using the OR Corrective provides many benefits. First, it is designed to give an accurate picture of the total book in usable form. That is, a book's readability is presented separately for the three main categories of content, and also as a whole-book score justified to reflect the emphasis the author has given to each of these categories. If an author has written a book aimed at providing a large number of exercises, that aim is accounted for in the book's readability score. If text is the author's principal concern, text is the principal focus in determining readability. Finally, the additional steps required to use the Corrective—counting a few additional samples and factoring percentages into the formulas—are not too time consuming. An ordinary calculator will easily figure percentages and work the formula. The OR Corrective, then, is a way to gain accurate readability data for workbooks/textbooks which pose special problems because of the way instruction is presented in the disciplines they address.

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